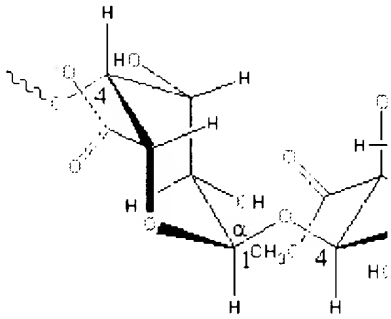
Pectin

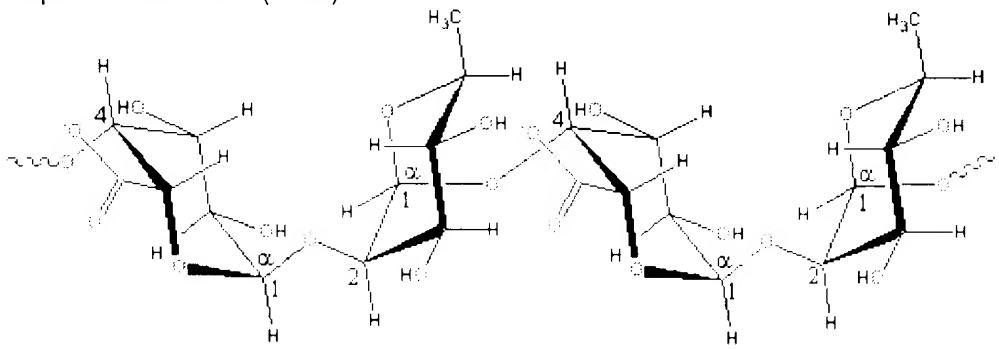
Source

Pectin (E440) is a structural polysaccharide, found in fruit and vegetables and mainly prepa 'waste' citrus peel and apple pomace.

Structural unit

The majority of the structure consists of partially methylated poly-α-(1→4)-D-galacturonic acid residues ('smooth', see right) but there are substantial 'hairy' non-gelling areas (see below) of alternating α -(1→2)-L-rhamnosyl-α -(1→4)-D-galacturonosyl sections containing branch-points with mostly neutral side chains (1 - 20 residues) of mainly L-arabinose and D-galactose but may also contain other residues such as D-xylose, L-fucose, D-glucuronic acid, D-apiose, 3-deoxy-D-*manno*-2-octulosonic acid (Kdo) and 3-deoxy-D-*lyxo*-2-heptulosonic acid (Dha).





Molecular structure

Generally, pectins do not possess exact structures [328]. D-galacturonic acid residues form

pectins are even more flexible and may have pendant arabinogalactans. The carboxylate gr

expand the structure of pectins as a result of their charge, unless they interact through diva bridging (their pK_a of about 2.9 [326] ensuring considerable negative charge under most cir Methylation of these carboxylic acid groups forms their methyl esters, which take up a simila are much more hydrophobic and consequently have a different effect on the structuring of th water. The properties of pectins depend on the degree of esterification, which is normally ab methoxyl-pectins (< 40% esterified) gel by calcium di-cation bridging between adjacent two- chains forming so-called 'egg-box' junction zone structures so long as a minimum of 14-20 r cooperate [326]. It may well be that the two carboxylate groups have to cooperate together bound water away from the calcium ions to form the salt links that make up these junction zo gelling ability of the di-cations is similar to that found with the alginates (Mg^{2+} << Ca^{2+}, Sr^{2} Na^+ and K^+ not gelling. If the methoxyl esterified content is greater than about 50%, calcium some interaction but do not gel. The similarity to the behavior of the **alginates** is that poly-α-(1→4)-D-galacturonic acid is almost the mirror image of poly-α-(1→4)-L-guluronic ac difference being that the 3-hydroxyl group is axial in the latter. The controlled removal of me converting high methoxyl pectins to low-methoxyl pectins, is possible using **pectin** methyles reverse process is not easily achieved.

High methoxyl-pectins (> 43% esterified) gel by the formation of hydrogen-bonding and hyc interactions in the presence of acids and sugars.

Functionality

Pectins are mainly used as gelling agents, but can also act as thickener, **water binder** and s methoxyl pectins (< 50% esterified) form thermoreversible gels in the presence of calcium ic pH (3 - 4.5) whereas high methoxyl pectins rapidly form thermally irreversible gels in the pre sufficient (e.g. 65% by weight) sugars such as sucrose and at low pH (< 3.5); the lower the r content, the slower the set. The degree of esterification can be (incompletely) reduced usin **pectin** methylesterase, leading to a higher viscosity and firmer gelling in the presence of Ca acetylated **pectin** from sugar beet is reported to have considerable emulsification ability du hydrophobic nature, but this may be due to protein impurities [309].

As with other viscous polyanions such as carrageenan, **pectin** may be protective towards n colloids, enhancing the properties (foam stability, solubility, gelation and emulsification) of v whilst utilizing them as a source of calcium.

Interactive structures are available (COW, 'smooth' [Plug-in, ActiveX], 14 KB; 'hairy' [Plug-i KB; both Chime, 8 KB).

Please submit any **comments and suggestions** you may have.